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**MALCOLM
PIRNIE**

Final Habitat Assessment Work Plan

**Cornell-Dubilier Electronics Superfund Site,
South Plainfield, NJ**

For: U.S. Army Corps of Engineers

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**U.S. Army Corps of
Engineers
Kansas City District**

CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
FINAL HABITAT ASSESSMENT WORK PLAN
FOR OPERABLE UNIT 2 (OU-2)
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1.0 PROJECT BACKGROUND

The Cornell-Dubilier Electronics Superfund Site (the Site) is located at 333 Hamilton Boulevard in South Plainfield, Middlesex County, New Jersey (Figure 1). The United States Environmental Protection Agency (USEPA) assigned EPA ID# NJD981557879 to the Site for identification purposes.

The Site consists of approximately 26 acres including the Hamilton Industrial Park, contaminated portions of the Bound Brook adjacent to and downstream of the industrial park, and contaminated residential, municipal, and commercial properties in the vicinity of the former Cornell-Dubilier Electronics Corporation, Inc. (Cornell-Dubilier Electronics) facility (Figure 2). The Site contains numerous subdivided buildings, numbered 1 through 18, some of which are currently used by several commercial and light industrial operations. For further detail drawings of Site buildings, reference the Malcolm Pirnie FSP dated November 2005.

The developed portion of the facility (the northwestern portion) comprises approximately 45 percent of the total land area and contains buildings, a system of catch basins to channel stormwater flow, and paved roadways. Several of the catch basins drain into a stormwater collection system whose outfalls discharge at various locations along Bound Brook. The other 55 percent of the property is predominantly vegetated. The central part of the undeveloped portion is primarily an open field, with some wooded areas to the northeast and south, and a deteriorated, partially paved area in the middle. The northeast and southeast boundaries consist primarily of wetland areas adjacent to Bound Brook, which flows from the eastern corner across the northeastern border of the undeveloped portion of the facility (Appendix A, Foster Wheeler, 2002).

The Site remediation was separated into multiple Operable Units. Operable Unit-1 (OU-1) consists of the residential, commercial, and municipal properties in the vicinity of the former Cornell-Dubilier Electronics facility and is being addressed by others. OU-2 consists of contaminated facility site soils and buildings which are being addressed by Malcolm Pirnie, Inc. The groundwater and sediments in the adjacent Bound Brook will

be addressed by the USEPA as part of future Operable Units. The response action selected in the Record of Decision (ROD) dated September 2004 for OU-2 soils includes:

1. Excavation of an estimated 107,000 cubic yards of contaminated soil containing PCBs at concentrations greater than 500 ppm and contaminated soils that exceed New Jersey's IGWSCC for contaminants other than PCBs;
2. On-site treatment of excavated soils amenable to treatment by Low Temperature Thermal Desorption (LTTD), followed by backfilling of excavated areas with treated soils;
3. Transportation of contaminated soil and debris not suitable for LTTD treatment to an off-site facility for disposal, with treatment as necessary;
4. Excavation of an estimated 7,500 cubic yards of contaminated soil and debris from the capacitor disposal areas and transportation for disposal off site, with treatment as necessary;
5. Installation of a multi-layer cap or hardscape;
6. Installation of engineering controls;
7. Property restoration; and
8. Implementation of institutional controls.

The purpose of this Habitat Assessment Work Plan (HAWP) is to provide regulatory and scientific guidance for the evaluation, data collection, classification and procedural implementation of available wildlife habitat with respect to joint jurisdictionally (federal and state) regulated wetlands and yet to be determined potential presence of rare/special concern, threatened and/or endangered species of flora and fauna for undeveloped (i.e., open field successional/forest habitat etc.) areas within OU-2 in accordance with the response action selected in the ROD.

1.1. SITE HISTORY AND CONTAMINANTS

Cornell-Dubilier Electronics operated what is now the Hamilton Industrial Park from 1936 to 1962, manufacturing electronic components including capacitors. Polychlorinated biphenyls (PCBs) and chlorinated organic degreasing solvents were used in the manufacturing process and it has been alleged that during Cornell-Dubilier Electronics' period of operation, the company disposed of PCB-contaminated materials and other hazardous substances at the facility. A former employee has claimed that the rear of the property was saturated with transformer oils and that capacitors were also buried behind the facility during the same time period (Foster Wheeler, 2002). Based on historic site practices, portions of the Site have the potential to be contaminated with VOCs, SVOCs, PCBs, dioxins, metals, pesticides, and other constituents of potential concern (COPCs).

2.0 PROJECT SCOPE AND OBJECTIVES

2.1. TASK DESCRIPTION

This HAWP presents the technical approach for conducting wetland delineations and floristic examinations for determining presence of rare, threatened and/or endangered plant species (assuming their potential presence) to support design of remediation and disposal of Cornell-Dubilier OU-2 Site soils. This document addresses the following methodologies:

- New Jersey Department of Environmental Protection (NJDEP) regulatory guidance for delineating jurisdictional wetlands within delegable waters. "Delegable waters" means all waters of the United States, as defined in N.J.A.C. 7:7A-1.4, within New Jersey, except waters which are presently used, or are susceptible to use in their natural condition or be reasonable improvement, as a means to transport interstate or foreign commerce, shoreward to their ordinary high water mark. This term includes all waters which are subject to the ebb and flow of the tide, shoreward to their mean high water mark, including wetlands that are partially or entirely located within 1000 feet of their ordinary high water mark or mean high tide. Waters that are not delegable waters include, but are not limited to:
 - 1) The entire length of the Delaware River within the State of New Jersey;
 - 2) Waters of the United States under the jurisdiction of the Hackensack Meadowlands Development Commission; and
 - 3) Greenwood Lake.
- NJDEP data request for searching the Natural Heritage Program database.
- Time meander survey methodology for federally and state protected plant specimens and/or preferred fauna habitat requirements.

2.2. WETLAND DELINEATION REPORT AND TIMED MEANDER SEARCH PROCEDURE DATA REPORT

Malcolm Pirnie, Inc. will provide a detailed wetland delineation report to the USACE and NJDEP upon completion of field data collection and licensed land survey. If a response from NJDEP Natural Heritage Program indicates that the likelihood for endangered, threatened, rare/special concern species of flora/fauna does exist on-site, a detailed data report summarizing the methodology, findings and relevance of the Timed Meander Search Procedure will also be submitted. Both reports will be submitted in both Draft and Final formats and will outline findings at each of the areas investigated. The Draft and Final wetland delineation report will address the following:

- Site history;
- Site conditions;
- Detailed breakdown of the 1989 Federal Methodology used for delineating wetlands;
- Wetland determination;
- Field data sheets;
- Photographic log;
- Site wetland survey map;
- Resumes and Certifications of wetland scientists
- Any other information required to support the findings.

The field report summarizing the methodology, findings and relevance of the timed meander survey will address the following:

- Site history;
- Site conditions;
- Detailed breakdown of the Timed Meander Search Procedure;
- Results of the Survey;
- Field data forms;
- Photographic log;
- Meander location survey map;

- Resumes and Certifications of field biologists
- Any other information required to support the findings.

2.3. APPLICABLE REGULATIONS/STANDARDS

The goal of this HAWP is to ensure compliance with the Applicable or Relevant and Appropriate Requirement (ARAR) procedures for wetlands/water resources and endangered species for review under CERCLA/SARA as part of the necessary data collection for the design of demolition and disposal of Site buildings and soils. Wetlands are defined by Executive Order 11990 on Protection of Wetlands, Section 7(c), and regulated under the Clean Water Act of 1972, as amended (16 USC 661), while endangered species are included under the Endangered Species Act of 1973, as amended (16 USC 1531). In addition to these specific CERCLA/SARA ARARs, compliance with other laws will include The Fish and Wildlife Coordination Act of 1934, as amended (16 U.S.C. 661 et. seq.), The Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. 703 et. seq.), The New Jersey Endangered and Non-game Species Conservation Act of 1973 (N.J.S.A. 23:2A et. seq.) and The New Jersey Surface Water Quality standards (N.J.A.C. 7:9B et. seq.). Although obtaining permits for remedial actions at Superfund sites are not required, compliance with the spirit of these laws would be required during the evaluation of Site-related ecological impacts as well as implementation of measures to offset or mitigate such impacts.

As stated in N.J.A.C. 7:7A-2.1(c), on March 2, 1994, the NJDEP has assumed responsibility for administering the Federal wetlands program (also known as the 404 program) from the U.S. Army Corps of Engineers (USACE) in delegable waters, as defined at N.J.A.C. 7:7A-1.4. Since Bound Brook and its adjacent floodplain meets the definition of delegable waters, the NJDEP and not the USACE is the governing agency for regulating wetlands within OU-2. The significance of this 1994 decision has resulted in NJDEP using the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands, Federal Interagency Committee for Wetland Delineation, 1989", and not the "1987 Corps of Engineers Wetland Delineation Manual (Dept. of the Army, 1987) and the Memorandum on 'Clarification and Interpretation of the 1987 Manual' (Dept. of the

Army, March 1992) that is used for the surrounding states (i.e. New York, Pennsylvania and Delaware etc.).

2.4. PROJECT SCHEDULE

The implementation of this HAWP will be conducted in accordance with the master project schedule as maintained with USACE and USEPA. It should be noted that the field work necessary to complete the requirements of this HAWP need to be conducted during the growing season and therefore for the most accurate results cannot occur between the period of November 1st through April 1st. In addition, other seasonal requirements may further limit the time period as to when biological surveys should occur to yield the highest probability of encountering the desired species of flora and possibly fauna being investigated.

3.0 FIELD METHODOLOGY FOR WETLAND DELINEATION AND TIMED MEANDER SEARCH PROCEDURE

HAWP activities at the Site will provide the technical basis for demarcating boundaries of NJDEP jurisdictional wetlands as well as identifying the presence or absence of endangered, threatened or rare/special concern species of flora/fauna, and/or their suitable habitat. Standard Operating Procedures (SOPs) that are applicable to each methodology are provided in the following sections. All wetland delineation methodologies will be used to confirm/supplement wetland information obtained in the Final Remedial Investigation (RI) Report Operable Unit 2 (OU-2) On-Site Soils and Buildings – Volume I and II developed by Tetra Tech-Foster Wheeler Inc. in 2002. The figure in Appendix A was reproduced from this Final RI report and presents the generalized wetland locations as identified by Tetra Tech-Foster Wheeler Inc.

3.1. WETLAND DELINEATION METHODOLOGY

3.1.1. Routine Onsite Determination Method, Plant Community Assessment Procedure

The plant community assessment procedure requires initial identification of representative plant community types in the subject area and then characterization of vegetation, soils and hydrology for each type. After identifying wetland and nonwetland communities, the wetland boundary is delineated. All pertinent observations on the three mandatory wetland criteria (hydrophytic vegetation, wetland hydrology and hydric soils) will be recorded on the field data sheets shown in Appendix B. The following presents a summary of the steps necessary to complete a routine determination using the plant community assessment procedure in accordance with Section 4.11 of the 1989 Federal Manual.

Step 1. Scan the entire project area, if possible, or walk, if necessary, and identify plant community types present. When conducting the initial site reconnaissance to broadly identify the dominant vegetative communities, Malcolm Pirnie, Inc. will pay particular attention to changes in elevation throughout the site. Although not anticipated for OU-2, if site elevations are highly variable (such as ridges or swale complexes), separate data sheets would be recorded for each elevation area to ensure proper stratification of the representative vegetative communities. If different wetland areas appear not necessarily based on elevation, but other site features as what appears to be previously indicated in Appendix A (Foster-Wheeler 2002), separate data sheets for each wetland area would also be completed. In addition, separate from the wetland delineation vegetation data inventory, Bound Brook's Shoreline and streambed will be investigated for species of emergent and aquatic macrophytes. These species will be recorded on the back of the wetland data forms for inclusion in the ecological subsection of the subsequent wetland delineation report.

During the reconnaissance, examination will be made to determine if any of the wetlands constitute significantly disturbed areas. Disturbed area is defined in the 1989 manual as an area where vegetation, soil, and/or hydrology have been significantly altered, thereby making a wetland determination difficult. Disturbed areas can be altered either recently or in the past in some way that makes wetland identification more difficult than it would be in the absence of such changes. Disturbed areas include both wetlands and nonwetlands that have been modified to varying degrees by human activities (e.g., filling, excavation, clearing, damming and building construction) or by natural events (e.g., fire and beaver dams). Such activities and events change the character of the area often making it difficult to identify field characteristics of one or more of the wetland identification criteria (i.e., hydrophytic vegetation, hydric soils and wetland hydrology). Disturbed wetlands include areas subjected to deposition of fill or dredged material, removal or other alteration of vegetation, conversion to agricultural land and silviculture plantations, and construction of levees, channelization and drainage systems, and/or dams that significantly modify an area's hydrology. In cases where recent human activities

have caused these changes, it would be helpful to determine the approximate date of the alteration or conversion for legal purposes. In considering the effects of natural events, the relative permanence of the change and whether the area is still functioning as a wetland will be considered.

An expansion of the disturbed area definition found in the 1989 wetland delineation manual would be applied to this particular site and include conditions of biota, soils, sediments and surface waters if impacted by historical or recent contamination by evidence of dead and/or stressed flora/fauna and potential observations of spills, sheens, stains and/or chemical odors in surface waters/sediments/soils. If encountered, these observations and their location will be recorded on the field data sheets and specially designated on the wetland delineation survey drawing.

If a potential wetland area is determined to be disturbed in accordance with the previous paragraph, Malcolm Pirnie, Inc. will identify these limits and evaluate this potential wetland separately. The procedure for delineating disturbed areas can be found in Appendix C. If the area is not significantly disturbed, we will proceed to Step 2.

Step 2. Determine whether normal environmental conditions are present. Malcolm Pirnie, Inc. will determine whether normal environmental conditions are present for each plant community by considering the following;

- 1) Is the area presently lacking hydrophytic vegetation or hydrologic indicators due to annual, seasonal or long-term fluctuations in precipitation, surface water, or ground-water levels?
- 2) Are hydrophytic vegetation indicators lacking due to seasonal fluctuations in temperature (i.e., seasonality of plant growth)?

There are certain types of wetlands and/or conditions that may make wetland identification difficult because field indicators of the three wetland identification criteria may be absent, at least at certain times of the year. These wetlands are considered problem area wetlands and not disturbed wetlands, because the difficulty in identification is generally due to normal environmental conditions and not the result of human activities or catastrophic natural events, with the exception of newly created wetlands. Artificial

wetlands are also included in this section because their identification presents problems similar to some of the natural problem area wetlands.

If the answer to either of the Step 2 questions is yes or uncertain, the procedure for problem area wetland determinations found in Appendix C would be followed. If the answer to both questions is no and normal conditions are assumed to be present, we will proceed to Step 3.

Step 3. Select representative observation area(s). One or more representative observation areas will be selected by Malcolm Pirnie, Inc. within each community type. A representative observation area is one in which the apparent characteristics (determined visually) best represent characteristics of the entire community. The approximate location of the observation areas will be located on a site base map before proceeding to Step 4.

Step 4. Characterize each plant community in the project area. Within each plant community identified in Step 1, Malcolm Pirnie, Inc. will visually estimate the dominant plant species for each vegetative stratum in the representative observation areas and record them on the field data sheet. Vegetative strata might include tree, sapling, shrub, herb, woody vine and bryophyte strata. A separate data sheet will be completed for each plant community identified for wetland determination purposes. Dominant species are those species in each stratum that, when ranked in decreasing order of abundance and cumulatively totaled, immediately exceed 50 percent of the total dominance measure for that stratum, plus any additional plant species comprising 20 percent or more of the total dominance measure for the stratum. After the dominants have been identified within each vegetative stratum, we will proceed to Step 5.

Step 5. Record the indicator status of dominant species in all vegetative strata. Indicator status is obtained from the interagency Federal list of plants occurring in wetlands for Region 1-Northeast. The following list is a definition of the indicator status designations:

- Obligate Wetland (OBL); Occurs with an estimated 99% probability in wetlands

- Facultative Wetland (FACW); Estimated 67%-99% probability of occurrence in wetlands
- Facultative (FAC); Equally likely to occur in wetlands and non-wetlands (34%-66% probability)
- Facultative Upland (FACU); Estimated 67%-99% probability of occurrence in non-wetlands
- Obligate Upland (UPL); Greater than 99% probability in non-wetlands in this region, may occur in wetlands in other regions (if a species doesn't occur in wetlands in any region, it is not included on the National List)
- No Indicator (NI); Insufficient information available to determine an indicator status
- No Occurrence (NO); Species does not occur in this region.

Positive or negative signs indicate a frequency toward higher (+) or lower (-) frequency of occurrence within a category. An asterisk (*) following a regional indicator identifies tentative assignments based on limited information from which to determine the indicator status.

A frequency analysis of all species within the community recorded on the field data sheets will yield a prevalence index value where OBL=1, FACW=2, FAC=3, FACU=4 and UPL=5. After the indicator status and prevalence index values have been recorded, we will proceed to Step 6.

Step 6. Determine whether the hydrophytic vegetation criterion is met. When more than 50 percent of the dominant species in each community type have an indicator status of OBL, FACW, and/or FAC, or the frequency analysis of all species within the community yields a prevalence index value of less than 3.0, the vegetation is hydrophytic. The vegetation section of the field data sheet will be completed and portions of the site failing this test are usually not wetlands. If it is believed that circumstances exist where the area is dominated by non-hydrophytic vegetative species when wetland hydrology and hydric soils are present (possibly disturbed), or hydrophytic vegetation may be present at other times of the year (possible problem area), the

disturbed area wetland delineation procedure or problem area wetland delineation procedures found in Appendix C, respectively, will be consulted. If hydrophytic vegetation is present, we will proceed to Step 7.

Step 7. Determine whether soils must be characterized. The vegetation data collected will be examined for each plant community and identified for potentially the following two conditions:

- 1) All dominant species have an indicator status of OBL or,
- 2) All dominant species have an indicator status of OBL and FACW and the wetland boundary is abrupt.

If either or both of these plant communities exist, hydric soils are assumed to be present and do not need to be examined and Malcolm Pirnie, Inc. would proceed to Step 9. Plant communities lacking the above characteristics would have the soils examined in these areas and therefore we would proceed to Step 8.

Step 8. Determine whether the hydric soil criterion is met. The site will be located on US Department of Agriculture, Soil Conservation Service soil survey for Middlesex County (assuming one exists) in order to determine the soil map unit delineation for the area. Using a soil auger, probe or spade, a hole will be made at least 18 inches in depth at the representative location in each plant community type. The soil characteristics will be examined and compared (if possible) to soil descriptions in the soil survey for Middlesex County. If soil colors match those described for hydric soil, this data will be recorded on the field data forms and we will proceed to Step 9. If this situation does not exist, then a check for hydric soil indicators below the A-horizon (surface layer) and within 18 inches for organic soils and for mineral soils with low permeability rates ($<6.0''/\text{hour}$), within 12 inches for coarse-textured (sandy) mineral soils with high permeability rates ($\geq 6.0''/\text{hour}$), and within 6 inches for somewhat poorly drained soils before proceeding to Step 9. In cases where the A-horizon extends below the designated depth, a visual inspection for signs of hydric soils will occur immediately below the A-horizon. Field indicators for hydric soils are considered to be present if one or more of the following conditions is present:

- 1) Organic soils – various peats and mucks are easily recognized as hydric soils.
- 2) Histic epipedons – a histic epipedon (organic surface layer) is an 8 to 16 inch organic layer at or near the surface of a hydric mineral soil that is saturated with water for 30 consecutive days or more in most years. It contains a minimum of 20 percent organic matter when no clay is present or a minimum of 30 percent organic matter when clay content is 60 percent or greater. Soils with histic epipedons are inundated or saturated for sufficient periods to greatly retard aerobic decomposition of organic matter, and are considered to be hydric soils. In general, a histic epipedon is a thin surface layer of peat or muck if the soil has not been plowed.
- 3) Sulfidic material – When soils emit an odor of rotten eggs, hydrogen sulfide is present. Such odors are only detected in waterlogged soils that are essentially permanently saturated and have sulfidic material within a few inches of the soil surface. Sulfides are produced only in reducing environments.
- 4) Aquic or preaquic regime – An aquic moisture regime is a reducing one, which means it is virtually free of dissolved oxygen, because the soil is saturated by ground water or by water of the capillary fringe. The soil is considered saturated if water stands in an unlined borehole at a shallow enough depth that the capillary fringe reaches the soil surface, except in noncapillary pores. Because dissolved oxygen is removed from ground water by respiration of microorganisms, roots, and soil fauna, it is implicit that the soil temperature be above biologic zero (41°F) at some time while the soil is saturated. Soils with preaquic moisture regimes are characterized by the presence of groundwater always at or near the soil surface.
- 5) Direct observations of reducing soil conditions – Soils saturated for long or very long durations will usually exhibit reducing conditions at the time

of saturation. Under such conditions, ions of iron are transformed from a ferric (oxidized) state to a ferrous (reduced) state.

- 6) Gleyed, low chroma, and low chroma/mottled soils – The colors of various soil components are often the most diagnostic indicator of hydric soils. Colors of these components are strongly influenced by the frequency and duration of soil saturation which leads to reducing soil conditions. Hydric mineral soils will be either gleyed or will have low chroma matrix with or without bright mottles. The three definitions for color variables used in the 1989 Wetland Delineation Manual are Hue, Value and Chroma. Hue is defined as a characteristic of color related to one of the main spectral colors (red, yellow, green, blue, or purple), or various combinations of these principle colors. Each color chart in the Munsell Soil Color Chart represents a specific hue. Value (soil color) is defined as the relative lightness or intensity of color (approximately a function of the square root of the total amount of light). Chroma is defined as the relative purity or saturation of a color (intensity of distinctive hue as related to grayness).
 - A) Gleyed soils – Gleying (bluish, greenish, or grayish colors) immediately below the A-horizon is an indication of a markedly reduced soil, and gleyed soils are hydric soils. Gleying can occur in both mottled and unmottled soils.
 - B) Other low chroma soils and mottled soils (i.e., soils with low matrix chroma and with or without bright mottles) – Hydric mineral soils that are saturated for substantial periods of the growing season, but are unsaturated for some time, commonly develop mottles. Soils that have brightly colored mottles and a low chroma matrix are indicative of a fluctuating water table. Hydric mineral soils usually have one of the following color features in the horizon immediately below the A-

horizon: matrix chroma of 2 or less in mottled soils, or matrix chroma of 1 or less in unmottled soils. Colors should be determined in soils that are or have been moistened.

- 7) Iron and manganese concretions – During the oxidation-reduction process, iron and manganese in suspension are sometimes segregated as oxides into concretions or soft masses. Concretions are local concentrations of chemical compounds (i.e., iron oxide) in the form of a grain or nodule of varying size, shape, hardness, and color. Manganese concretions are usually black or dark brown, while iron concretions are usually yellow, orange or reddish brown. In hydric soils, these concretions are also usually accompanied by soil colors described above.
- 8) Coarse-textured or sandy hydric soils – Many of the previous indicators cannot be applied to sandy soils (i.e., soil color should not be used as an indicator in most sandy soils). However, three soil features may be used as indicators of hydric sandy soils.
 - A) High organic matter content in the surface horizon – Organic matter tends to accumulate above or in the surface horizon of sandy soils that are inundated or saturated to the surface for a significant portion of the growing season. The mineral surface layer generally appears darker than the mineral material immediately below it due to organic matter interspersed among or adhering to sand particles.
 - B) Dark vertical streaking of subsurface horizons by organic matter – Organic matter is moved downward through sand as the water table fluctuates. This often occurs more rapidly and to a greater degree in some vertical sections of a sandy soil containing high content of organic matter than in others. Thus, the sandy soil appears vertically streaked with darker

areas. When soil from a darker area is rubbed between the fingers, the dark organic matter stains the fingers.

- C) Wet Spodosols – As organic matter is moved downward through some sandy soils, it may accumulate at the point representing the most commonly occurring depth to the water table. This organic matter may become slightly cemented with aluminum. Spodic horizons often occur at depths 12 to 30 inches below the mineral surface. Wet spodosols (formerly called groundwater podzolic soils) usually have thick dark surface horizons that are high in organic matter with thick, dull gray E-horizons above a very dark-colored (black) spodic horizon. Some soils have an E-horizon, characterized by leaching of organic and material.

Step 9. *Determine whether the wetland hydrology criterion is met.* The area of each plant community type will be examined for indicators of wetland hydrology. Field indicators for wetland hydrology include the following observations:

- 1) Visual observation of inundation – The most obvious and revealing hydrologic indicator is observing the areal extent of inundation. However, both seasonal conditions and recent weather conditions will be considered when observing an area since both can affect whether surface water is present on a nonwetland site.
- 2) Visual observation of soil saturation – When walking on the ground surface and extremely soggy or muck conditions are encountered, saturated soils would obviously be considered present. In other cases, Malcolm Pirnie, Inc. will examine this indicator by augering a hole to a depth of 18 inches and observing the level at which water stands in the hole after sufficient time has been allowed for water to percolate/seep into the hole. Our required observation time will depend on the soil texture

encountered. In cases where the upper level at which water is flowing into the hole can be observed by examining the wall of the hole, this level will represent the depth to the water table and be recorded on the field data sheet. The depth to saturated soils will always be nearer the surface due to a capillary fringe. For some heavy clay soils, water may not rapidly accumulate in the hole even when the soil is saturated. If for these soils water is observed at the bottom of the hole but has not filled to the 12-inch depth, the sides of the hole will be examined by Malcolm Pirnie, Inc. to determine the shallowest depth at which water is entering the hole. Saturated soils may also be detected by a "squeeze test", which involves taking a soils sample within 18 inches (actual depth will vary depending upon soil permeability) and squeezing the sample. If free water can be extracted, the soil is saturated at the depth of the sample at this point in time.

- 3) Oxidized channels (rhizospheres); associated with living roots and rhizomes) – Physical adaptations of some plants enable them to survive saturated soils conditions (i.e., reducing environment) because they can transport oxygen to their root zone. If applicable, Malcolm Pirnie, Inc. will look for iron oxide concretions (orangish or reddish brown in color) forming along the channels of living roots and rhizomes as evidence of soil saturation (anaerobic conditions) for a significant period of the growing season.
- 4) Water marks – These marks are commonly found on woody vegetation and may also be observed on other vegetation. Water marks often occur as stains on bark or other fixed objects (i.e., fences, buildings etc.). If water marks are observed, it will be noted on the field data sheets and since the highest level usually reflects the maximum extent of recent inundation; the measured

elevation of this high mark will be included as part of the licensed survey required for demarcation of the wetland.

- 5) Drift lines – This indicator is typically found adjacent to streams or other sources of water flow in wetlands. Evidence consists of deposition of debris in a line on the wetland surface or debris entangled in aboveground vegetation or other fixed objects. Debris usually consists of remnants of vegetation (branches, stems, leaves etc.), sediment, litter, and other water-borne materials deposited more or less parallel to the direction of water flow. Since drift lines provide an indication of the minimum portion of the area inundated during a flooding event, or possibly the maximum level of inundation which is generally at a higher elevation than that indicated by a drift line, Malcolm Pirnie, Inc. will record this information on the field data sheet and appropriate elevations of these lines will be included as part of the licensed survey required for demarcation of the wetland.
- 6) Water-borne sediment deposits – Plants and other vertical objects often have thin layers, coatings or depositions of mineral or organic matter on them after inundation. This evidence may remain for a considerable period before it is removed by precipitation or subsequent inundation. Sediment deposition on vegetation and other objects provides an indication of the minimum inundation level. When sediments are primarily organic (i.e., fine organic material and algae), the detritus may become encrusted on or slightly above the soil surface after dewatering occurs.
- 7) Water-stained leaves – Forested wetlands that are inundated earlier in the year will frequently have water-stained leaves on the forest floor. These leaves are generally grayish or blackish in

appearance, and darkened from being underwater for significant periods.

- 8) Surface scoured areas – Surface scouring occurs along floodplains where overbank flooding erodes sediments (i.e., at the bases of trees). The absence of leaf litter from the soil surface is also sometimes an indication of surface scouring. Forested wetlands that contain standing water for a relatively long duration will occasionally have areas bare or essentially bare soil that can be associated with local depressions.
- 9) Wetland drainage patterns – Many wetlands (i.e., floodplain wetlands) have characteristic meandering or braided drainage patterns that are readily recognized in the field or on aerial photographs and occasionally on topographic maps. Since drainage patterns can also occur in upland areas after periods of considerable precipitation, topographic position will also be considered in applying this field indicator.
- 10) Morphological plant adaptations – Many plants growing in wetlands have developed morphological adaptations in response to inundation or soil saturation. Examples include pneumatophores, buttressed tree trunks, multiple trunks, adventitious roots, shallow root systems, floating stems, floating leaves, polymorphic leaves, hypertrophied lenticels, inflated leaves, stems or roots, and aerenchyma (air-filled) tissue in roots and stems. As long as there is no evidence of significant hydrologic modification, these adaptations can be used as hydrologic indicators. Additionally, when these features are observed in young plants they provide good evidence that recent wetland hydrology exists.
- 11) Hydric soil characteristics – In the absence of the ten previous indicators listed, if an area meets the field indicators for hydric

soils and there is no indication of significant hydrologic modification, then it will be assumed by Malcolm Pirnie, Inc. that the area meets the wetland hydrology criterion. If the area has been significantly disturbed hydrologically, the appropriate section on delineating disturbed area wetlands in Appendix C will be referred to.

The wetland hydrology criterion will be considered met when one or more of the following three are encountered:

- 1) one or more of the eleven field indicators are present; or
- 2) available hydrologic records provide sufficient evidence; or
- 3) the plant community is dominated by OBL, FACW and/or FAC species or has a prevalence index of less than 3.0, and the area has not been hydrologically disturbed.

If the area is hydrologically disturbed, the procedure for delineating disturbed areas would be used and can be found in Appendix C. If the area is not hydrologically disturbed, observations will be recorded and other evidence will be recorded on the field data sheet and we will proceed to Step 10.

Step 10. Make the wetland determination. The field data sheets will be examined for each plant community identified in the wetland areas. Each community meeting the hydrophytic vegetation, hydric soil, and wetland hydrology criteria will be considered a wetland. The wetland-nonwetland boundary will then be established by proceeding to Step 11.

Step 11. Determine the wetland-nonwetland boundary. On a site base map, each plant community type will be generally marked in the field to separate the wetlands from the nonwetlands. At the wetland-nonwetland interface, the boundaries will be flagged with surveying tape and each flag will be marked separately to indicate data points which need to be located by a licensed surveyor or by Global Positioning Technology (GPS) in

order to accurately connect these points which will locate and properly orient these wetlands onto the Site base map. If a surveyor is not used, a Trimble GeoXH GPS unit will be operated by Malcolm Pirnie Inc field biologists to survey the wetland-nonwetland boundary. The features of this unit are capable of achieving sub-foot (30cm) accuracy depending upon field conditions encountered. Since dense tree canopy and/or positioning of fewer satellites in the GPS's range can prolong field time as such conditions significantly increase the units required time to collect data necessary for an individual point to sub-foot accuracy, sub-meter accuracy is more representative of what will likely be achieved.

3.1.2. Evaluation of Wetland Function and Value

Wetland function and values form an integral part in the decision making process by the USACE in regulating wetlands under Section 404 of the Clean Water Act. Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society. Functions result from both living and non-living components of a specific wetland as they relate to the ecological significance of wetland properties without regard to subjective human values. Values are benefits that derive from either one or more functions and the physical characteristics associated with a wetland. The value of a particular wetland function, or combination thereof, is based on human judgement of the worth, merit, quality, or importance attributed to those functions. For example, a particular wetland that functions as storage capacity for floodwaters would be valued to society if the attenuation of floodwaters lessens the destructive severity of flood to an adjacent developed area.

Concurrent with performance of the wetland delineation, an evaluation of wetland function/value in accordance with the USACE as found in "The Highway Methodology Workbook *Supplement*; Wetlands Functions and Values *A Descriptive Approach*" will also be completed. A total of eight functions and five values are considered for completing this methodology and include:

- Groundwater Recharge/Discharge
- Floodflow Alteration (Storage & Desynchronization)
- Fish and Shellfish Habitat
- Sediment/Toxicant/Pathogen Retention
- Nutrient Removal/Retention/Transformation
- Production Export (Nutrient)
- Sediment/Shoreline Stabilization
- Wildlife Habitat
- Recreation (Consumptive and Non-Consumptive)
- Educational/Scientific Value
- Uniqueness/Heritage
- Visual Quality/Aesthetics
- Threatened or Endangered Species Habitat

The evaluation form to be used for recording this information during the wetland delineation is shown in Appendix D.

3.2. RESEARCH PROCEDURE FOR ENDANGERED, THREATENED OR RARE SPECIES OF FLORA AND FAUNA

3.2.1. New Jersey Natural Heritage Program

The New Jersey Natural Heritage Program identifies the state's most significant natural areas through a comprehensive inventory of rare plant and animal species and representative ecological communities. From this inventory, the Natural Heritage Database compiles information on the distribution, biology, status and preservation needs of these species and communities. Established in 1984 through a cooperative agreement between The Nature Conservancy, a private conservation organization, and the NJDEP,

full administration of the program was assumed in 1986 by the New Jersey Natural Heritage Program.

The New Jersey Natural Heritage Program is part of an international network including State Natural Heritage Programs and Conservation Data Centers, all building on the same data collection methodology. The Database is updated continuously and is used to set state, national, and global priorities for the preservation of natural diversity.

Malcolm Pirnie, Inc. will complete the data request for the Site's potential to contain rare/special concern, threatened and/or endangered flora/fauna species by completing the Natural Heritage Data Request Form found in Appendix E, which will include the following information:

- Name and address of user or organization
- Type of data needed
- Copy of USGS quad with exact boundaries
- Explanation of how the information will be used

Data requests are processed by the New Jersey Natural Heritage Program in the order in which they are received. The response time depends on the backlog at the time of the request is logged in (the average turnaround time is 2 weeks). Fees are charged to cover the cost of providing data services. The minimum charge is \$20, and charges for searches exceeding one hour are charged in half-hour increments at \$20 per hour.

If upon receiving the data the New Jersey Natural Heritage Program concludes that rare/special concern, threatened and/or endangered flora/fauna species are not present at the Site, then research for protected species of flora/fauna will be considered completed and no additional field surveys would be required. If protected species of flora and/or fauna or habitats are identified as potentially occurring at the Site, the following Timed Meander Search Procedure would be conducted.

In addition to utilizing New Jersey Natural Heritage Program staff, a Malcolm Pirnie, Inc. staff biologist versed in GIS will search the NJDEP Landscape Project database and review the polygons representing approximate locations of state protected

flora and fauna species potentially overlapping boundaries defining the Site. Although these polygons do not represent specific locations of protected species (because such information is usually kept confidential) flora and/or fauna identified from this database as potentially overlapping boundaries of the Site will have their habitat requirements reviewed (Beans and Niles). Searching the GIS database prior to conducting the wetland delineation and timed meander search procedure will aide the biologists in identifying potential habitat areas, and if necessary, specifically reference such areas as potential habitat on data sheets and field notes for the purpose of showing such designations on survey drawings.

At the federal level, it should be noted that USEPA conducted informal Section 7 consultation with the USFWS in 1999 for the site. Results of this consultation indicated that except for the occasional transient bald eagle, no federally-listed species were known to occur in the proposed project area. Due to the fact that this consultation occurred approximately seven years ago, the USFWS would again be contacted. In addition to this federal agency, the National Marine Fisheries Service will also be contacted due to the hydrologic connection of Bound Brook to the Raritan River through Green Brook.

3.2.2. Timed Meander Search Procedure

A procedure is described for conducting floristic examinations of prospective sites of development/disturbance in order to determine the presence of rare, threatened and/or endangered plant species. The Timed Meander Search Procedure provides information to document the level of effort expended in the examination as well as to describe the floristic resources of a site. Validation tests of the procedure during the 1979 and 1980 field seasons by researchers demonstrated its value both as a means of discovering threatened and endangered species on a site and as a means of documenting a low probability of occurrence of such species if not found during application of the procedure (Goff, et. al., 1982).

It should be noted that although this procedure is specific to only fixed biological resources (i.e., plants), it will provide the means necessary to determine if unique habitat

exists for any potential special concern, threatened and/or endangered species of wildlife identified by the New Jersey Natural Heritage Program. In essence, since "absence of evidence" does not enable one to necessarily conclude "evidence of absence" due to the mobility afforded many wildlife species (i.e., walking/flying/swimming/burrowing etc.), this survey will ascertain as to whether the preferred habitat, vegetative cover type and/or vegetative species necessary for the survival of such an organism (i.e., feed/breed/nest/cover etc.) is available at the Site. If such preferred habitat does exist, even in the absence of observing any protected individual wildlife species during the survey, it is possible that the need to conclude a likelihood for this species to utilize relevant portion(s) of the Site for its survival and/or propagation does exist. Regardless of whether the potential occurrence of protected species is determined to flora or fauna, the following steps outline the requirements for completing the Timed Meander Search Procedure and presentation of the data collected.

Step 1. Timed Meander Search Procedure. The Timed Meander Search Procedure will be conducted by Malcolm Pirnie, Inc. within field units which are delineated from either aerial photographs or by on-the-ground reconnaissance (whichever is deemed more appropriate for this particular assignment that can be determined after completing the wetland delineation segment of this HAWP). A convenient point of entry to the Site will be chosen, and the time of beginning the examination will be recorded. Vegetative species will be recorded in a field notebook as they are encountered in whatever field of view where positive identifications can be reasonably completed and species whose identities are uncertain will be recorded as such and collected for identification by experts knowledgeable of the regional taxa.

The transect meander will not be a straight line, but an attempt to cover all habitat variation within the field unit as thoroughly as possible. The meandering transect may double back over previously covered ground, follow a zig-zag pattern, or take any other form, so long as maximum coverage of variation within the field unit is provided. The surrounding terrain will be observed within the field of view and a course of meander will be chosen by Malcolm Pirnie, Inc. that appears most likely to yield new species

populations. Malcolm Pirnie, Inc. observations will continue, keeping track mentally of the ground traversed and orienting the path of meander to cover all internal variation of the unit as thoroughly as possible, until in our judgment no new species will be encountered with additional search effort.

After each few (10 or fewer) minutes of examination, the time elapsed will be noted in the field book, dividing the species lists into sets of species recorded or collected during each time interval. If an interruption of the process is necessary, it is considered as time out from the process, eliminating such interruptions from the timed search. For example, upon entering a field unit, several species may be listed before moving from the starting point. Then, observation of a variation in cover several meters away from the point of origin may take Malcolm Pirnie, Inc. to that particular point again resulting in several species being recorded without appreciable movement. As long as vegetation is being observed and recorded, this will not be considered an interruption regardless of Malcolm Pirnie, Inc.'s lack of physical movement/displacement when conducting the survey of the Site.

Step 2. Species/Effort Relationships. By maintaining equal intensity of search effort throughout the total sampling period, Malcolm Pirnie, Inc. will develop a table as part of the field report that reveals the species/effort curve resulting from the field data recorded. This curve will document the level of effort expended during the search and give an indication of efficiency. It will also provide a visual means of interpreting floristic variations within the field units encountered and present species richness information. The curve will be presented with the x-axis representing the cumulative number of species recorded, and the y-axis will be elapsed time (effort) spent during the examination (minutes). The goal is for the species/effort curves to reveal a definite leveling off and that approximately 30 minutes were spent near the end of the survey without finding any additional species before the search was terminated.

Step 3. Floristic Analysis. In addition to the species/effort curve, a frequency histogram showing the number of species (left scale) by number of field units of occurrence (bottom scale) will also be generated. Species occurring in one field unit only

are included in the first bar on the graph, species occurring in two units in the second bar graph, and so on until each field unit is represented by a bar graph. The rising solid line produced on this graphical representation will show the cumulative percentage (right scale) of all species encountered occurring at or below each number of field units of occurrence until appearing to level out when approaching 100% (top scale). The significance of this graphical representation approaching 100% enables one to conclude that based on the field data collected, dominant vegetative cover types within the Site have been visited and observed species within these cover types have been recorded.

Step 4. Conclusions. Unique habitats often support assemblages of flora and fauna which have the potential to include state and federally protected species or their habitats. Classification and general characterization of the community types occurring at the Site will be compared to the list of protected flora/fauna received by the New Jersey Natural Heritage Program to determine if unique habitat types or individuals of protected species have been detected as a result of the Timed Meander Search Procedure. If none are identified, then the conclusion of no protected species or unique habitat types exist at the Site can be reached and no further investigation is warranted. If this conclusion cannot be reached, further unidentified analyses and procedures resulting from consultation with the New Jersey Natural Heritage Program would need to be completed at a yet to be determined future date.

4.0 REFERENCES

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Goff, Glenn F.; Dawson, Gary F. and Rochow, John J. "Site Examination for Threatened and Endangered Plant Species." Environmental Management, Vol. 6, No. 4, pp. 307-316. ©1982 Springer-Verlag New York, Inc.

Department of the Army, US Fish and Wildlife Service, US Environmental Protection Agency and US Soil Conservation Service; An Interagency Cooperative Publication, January 10, 1989. "Federal Manual for Identifying and Delineating Jurisdictional Wetlands."

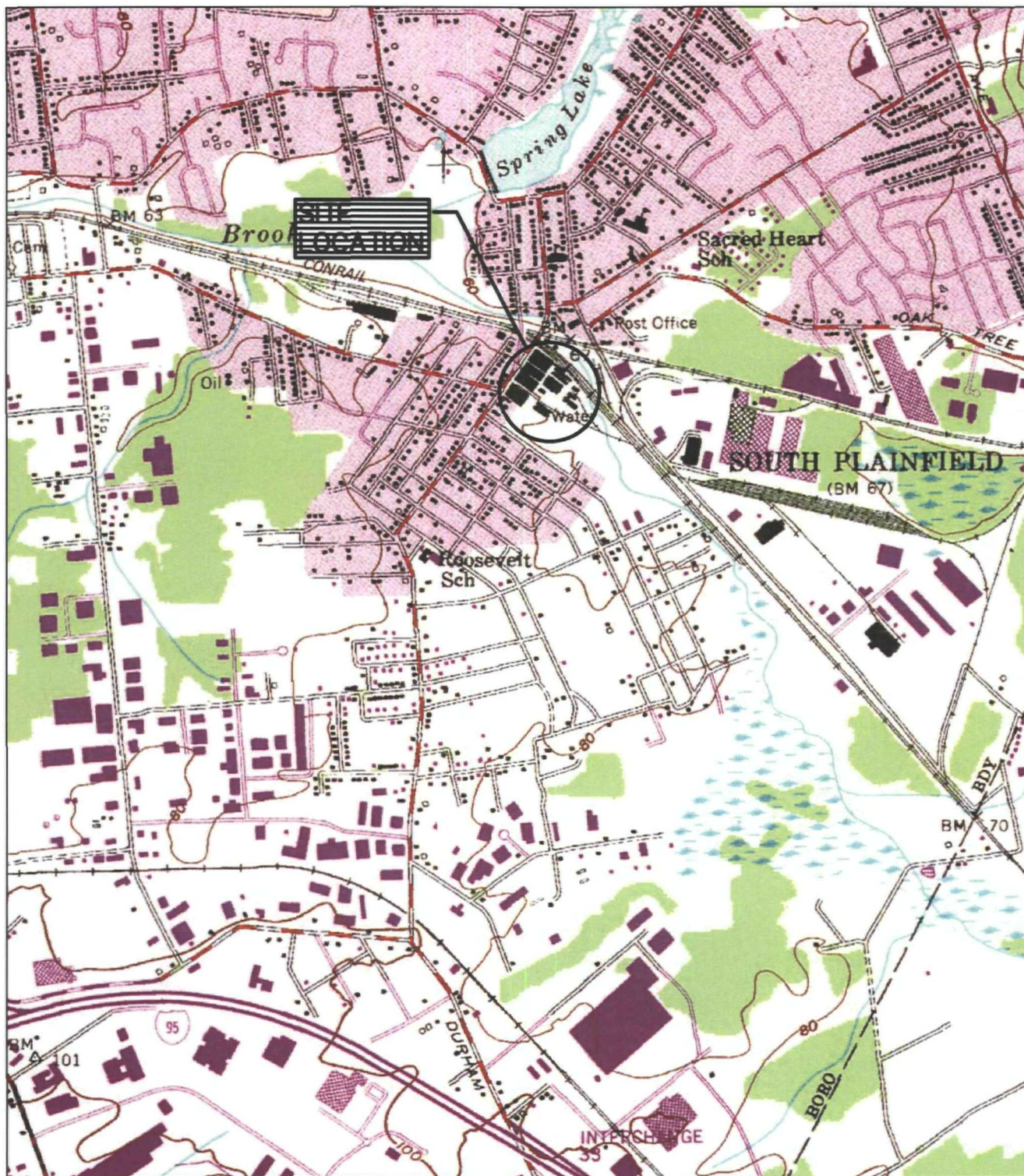
Tetra Tech-Foster Wheeler, Inc., December 2002. "Final Remedial Investigation Report for Operable Unit 2 (OU-2) On-Site Soils and Buildings – Volume I and II" Cornell-Dubilier Electronics Superfund Site, South Plainfield, New Jersey.

New Jersey Administrative Code. Title 7 Department of Environmental Protection, Chapter 7A Freshwater Wetlands Protection Act Rules.

Internet reference for NJDEP Natural Heritage Program:
www.state.nj.us/dep/parksandforests/natural/heritage

US Army Corps of Engineers, New England District. "The Highway Methodology Workbook *Supplement*; Wetlands Functions and Values *A Descriptive Approach*." September 1999, NAEPP-360-1-30a.

FIGURES



SOURCE: U.S.G.S. TOPOGRAPHIC MAP,
7.5 MINUTE SERIES, PLAINFIELD, NEW JERSEY
QUADRANGLE, 1955, PHOTOREVISED 1981

REF:

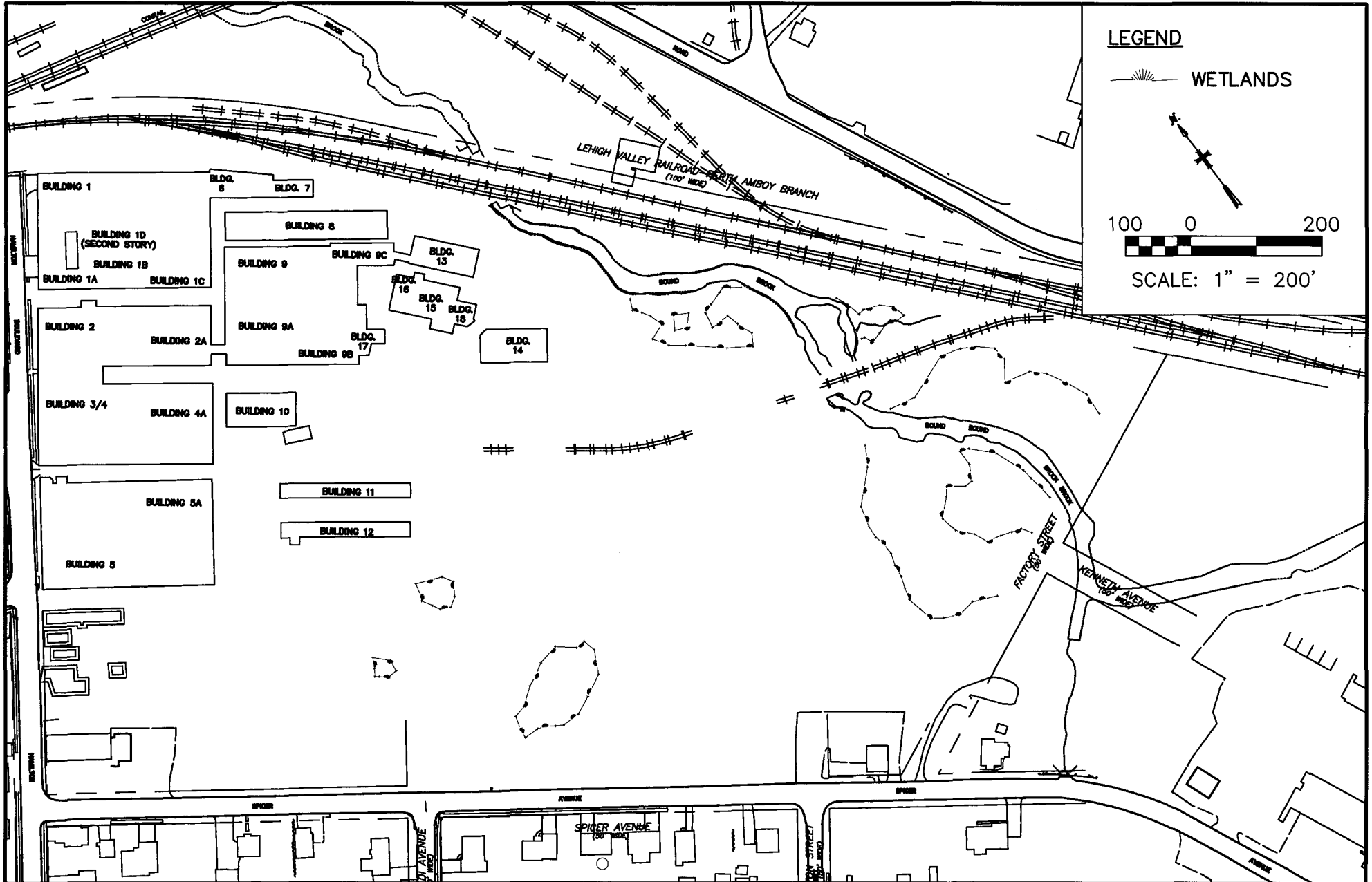
**MALCOLM
PIRNIE**

U.S. ARMY CORPS OF ENGINEERS
CORNELL-DUBILIER SUPERFUND SITE
SOUTH PLAINFIELD, NJ
CONTRACT No:
W912DQ-06-D-006

SITE LOCATION
MAP
SCALE AS NOTED

MALCOLM PIRNIE, INC.

JUNE 2006
FIGURE 1



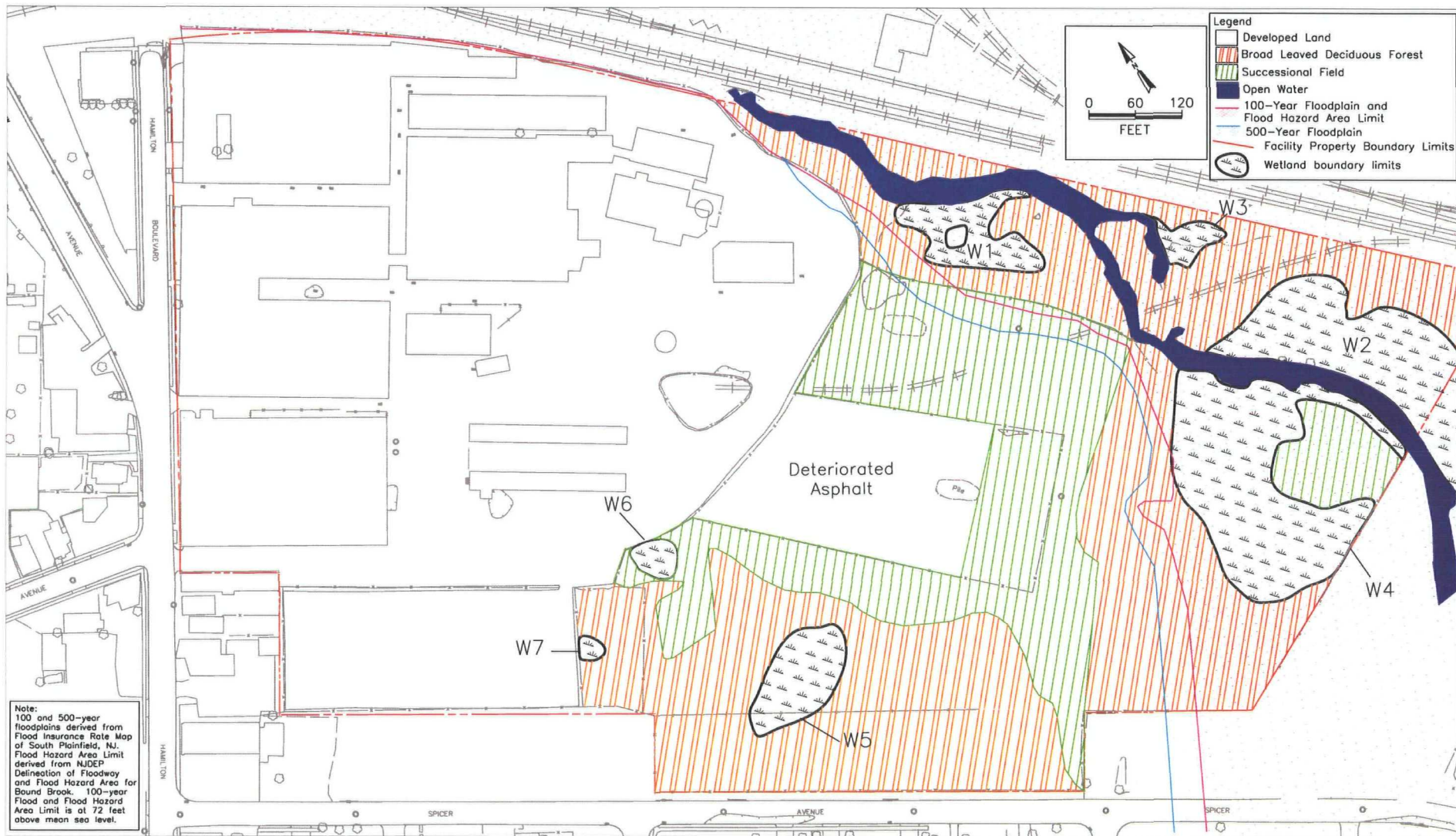
**MALCOLM
PIRNIE**

U.S. ARMY CORPS OF ENGINEERS
CORNELL-DUBILIER ELECTRONICS SUPERFUND SITE
SOUTH PLAINFIELD, NEW JERSEY
CONTRACT: DACW41-02-D-0003, TO 0034

SITE PLAN

MALCOLM PIRNIE, INC.
NOVEMBER 2005
FIGURE 2

APPENDIX A



FOSTER WHEELER ENVIRONMENTAL CORPORATION

TITLE:
Ecological Settings
Cornell-Dubilier Electronics Superfund Site
Facility Soils and Buildings RI Report

DWN.: CTS	DATE: 05/08/01	PROJECT NO.: 1945.1018
CHKD: GD	REV.: 0	FIGURE NO.: 3-11
DES.: JS/LBR	APPD: LH	

APPENDIX B

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD¹

Field Investigator(s): _____ Date: _____

Project/Site: _____ State: _____ County: _____

Applicant/Owner: _____ Plant Community #/Name: _____

Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Do normal environmental conditions exist at the plant community?

Yes _____ No _____ (If no, explain on back)

Has the vegetation, soils, and/or hydrology been significantly disturbed?

Yes _____ No _____ (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. _____	_____	_____	11. _____	_____	_____
2. _____	_____	_____	12. _____	_____	_____
3. _____	_____	_____	13. _____	_____	_____
4. _____	_____	_____	14. _____	_____	_____
5. _____	_____	_____	15. _____	_____	_____
6. _____	_____	_____	16. _____	_____	_____
7. _____	_____	_____	17. _____	_____	_____
8. _____	_____	_____	18. _____	_____	_____
9. _____	_____	_____	19. _____	_____	_____
10. _____	_____	_____	20. _____	_____	_____

Percent of dominant species that are OBL, FACW, and/or FAC _____

Is the hydrophytic vegetation criterion met? Yes _____ No _____

Rationale: _____

SOILS

Series/phase: _____ Subgroup:² _____

Is the soil on the hydric soils list? Yes _____ No _____ Undetermined _____

Is the soil a Histosol? Yes _____ No _____ Histic epipedon present? Yes _____ No _____

Is the soil: Mottled? Yes _____ No _____ Gleyed? Yes _____ No _____

Matrix Color: _____ Mottle Colors: _____

Other hydric soil indicators: _____

Is the hydric soil criterion met? Yes _____ No _____

Rationale: _____

HYDROLOGY

Is the ground surface inundated? Yes _____ No _____ Surface water depth: _____

Is the soil saturated? Yes _____ No _____

Depth to free-standing water in pit/soil probe hole: _____

List other field evidence of surface inundation or soil saturation.

Is the wetland hydrology criterion met? Yes _____ No _____

Rationale: _____

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes _____ No _____

Rationale for jurisdictional decision: _____

¹ This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.

² Classification according to "Soil Taxonomy."

APPENDIX C

Disturbed Area and Problem Area Wetland Determination Procedures

4.20. In the course of field investigations, one will undoubtedly encounter significantly disturbed or altered areas, or natural areas where making a wetland determination is not easy. Disturbed areas include situations where field indicators of one or more of the three wetland identification criteria are obliterated or not present due to recent change. In contrast, there are other wetlands that, under natural conditions, are simply difficult to identify, such as wetlands dominated by FACU species, wetlands lacking field indicators for one or more of the technical criteria for wetlands, and wetlands occurring on difficult to identify hydric soils. These wetlands are considered problem area wetlands. The following sections discuss these difficult, confounding situations and present procedures for distinguishing wetlands from nonwetlands.

Disturbed Areas

4.21. Disturbed areas have been altered either recently or in the past in some way that makes wetland identification more difficult than it would be in the absence of such changes. Disturbed areas include both wetlands and nonwetlands that have been modified to varying degrees by human activities (e.g., filling, excavation, clearing, damming, and building construction) or by natural events (e.g., avalanches, mudslides, fire, volcanic deposition, and beaver dams). Such activities and events change the character of the area often making it difficult to identify field characteristics of one or more of the wetland identification criteria (i.e., hydrophytic vegetation, hydric soils, and wetland hydrology). Disturbed wetlands include areas subjected to deposition of fill or dredged material,

removal or other alteration of vegetation, conversion to agricultural land and silviculture plantations, and construction of levees, channelization and drainage systems, and/or dams (e.g., reservoirs and beaver dams) that significantly modify an area's hydrology. In cases where recent human activities have caused these changes, it may be necessary to determine the date of the alteration or conversion for legal purposes. (*Note: If the activity occurred prior to the effective date of regulation or other jurisdiction, it may not be necessary to make a wetland determination for regulatory purposes.*) In considering the effects of natural events (e.g., a wetland buried by a mudslide), the relative permanence of the change and whether the area is still functioning as a wetland must be considered.

4.22. In disturbed wetlands, field indicators for one or more of the three technical criteria for wetland identification are usually absent. It may be necessary to determine whether the "missing" indicator(s) (especially wetland hydrology) existed prior to alteration. To do this requires review of aerial photographs, existing maps, and other available information about the site, and may involve evaluating a nearby reference site (similar to the original character of the one altered) for indicator(s) of the "altered" characteristic.

4.23. When a significantly disturbed condition is detected during an onsite determination, the following steps should be taken to determine if the "missing" indicator(s) was present before alteration and whether the criterion in question was originally met. Be sure to record findings on the appropriate data form. After completing the necessary steps below, return to the applicable step of the onsite determination method being used and continue evaluating the site's characteristics.

Step 1. Determine whether vegetation, soils, and/or hydrology have been significantly altered at the site. Proceed to Step 2.

Step 2. Determine whether the "altered" characteristic met the wetland criterion in question prior to site alteration. Review existing information for the area (e.g., aerial photos, NWI maps, soil surveys, hydrologic data, and previous site inspection reports) contact knowledgeable persons familiar with the area, and conduct an onsite inspection to build supportive evidence. The strongest evidence involves considering all of the above *plus* evaluating a nearby reference site (an area similar to the

one altered before modification) for field indicators of the three technical criteria for wetland. If a human activity or natural event altered the vegetation, proceed to Step 3; the soils, proceed to Step 4; the hydrology, proceed to Step 5.

Step 3. Determine whether hydrophytic vegetation previously occurred:

1) *Describe the type of alteration.* Examine the area and describe the type of alteration that occurred. Look for evidence of selective harvesting, clearcutting, bulldozing, recent conversion to agriculture, or other activities (e.g., burning, discing, the presence of buildings, dams, levees, roads, and parking lots).

2) *Determine the approximate date when the alteration occurred if necessary.* Check aerial photographs, examine building permits, consult with local individuals, and review other possible sources of information.

3) *Describe the effects on the vegetation.* Generally describe how the recent activities and events have affected the plant communities. Consider the following:

A) Has all or a portion of the area been cleared of vegetation?

B) Has only one layer of the plant community (e.g., trees) been removed?

C) Has selective harvesting resulted in the removal of some species?

D) Has the vegetation been burned, mowed, or heavily grazed?

E) Has the vegetation been covered by fill, dredged material, or structures?

F) Have increased water levels resulted in the death of all or some of the vegetation?

4) *Determine whether the area had hydrophytic vegetation communities.* Develop a list of species that previously occurred at the site from existing information, if possible, and determine presence of hydrophytic vegetation. If site-specific data do not exist, evaluate a neighboring undisturbed area (reference site) with characteristics (i.e., vegetation, soils, hydrology, and topogra-

phy) similar to the area in question prior to its alteration. Be sure to record the location and major characteristics (vegetation, soils, hydrology, and topography) of the reference site. Sample the vegetation in this reference area using an appropriate onsite determination method to determine whether hydrophytic vegetation is present. If hydrophytic vegetation is present at the reference site, then hydrophytic vegetation is presumed to have existed in the altered area. If no indicators of hydrophytic vegetation are found at the reference site, then the original vegetation at the project area is not considered hydrophytic vegetation. If soils and/or hydrology also have been disturbed, then continue Step 4, 5, and 6 below, as necessary. Otherwise, return to the applicable step of the onsite determination method being used.

Step 4. Determine whether or not hydric soil: previously occurred:

1) *Describe the type of alteration.* Examine the area and describe the type of alteration that occurred. Look for evidence of:

A) *deposition of dredged or fill material or natural sedimentation* - In many cases the presence of fill material will be obvious. If so, it will be necessary to dig a hole to reach the original soil (sometimes several feet deep). Fill material will usually be a different color or texture than the original soil (except when fill material has been obtained from similar areas onsite). Look for decomposing vegetation between soil layers and the presence of buried organic or hydric mineral soil layers. In accreting or recently formed sandbars in riverine situations, the soils may support hydrophytic vegetation but lack hydric soil indicators.

B) *presence of nonwoody debris at the surface* - This can only be applied in areas where the original soils do not contain rocks. Nonwoody debris includes items such as rocks, bricks, and concrete fragments.

C) *subsurface plowing* - Has the area recently been plowed below the A-horizon or to depths of greater than 10 inches?

D) *removal of surface layers* - Has the surface soil layer been removed by scraping or natural landslides? Look for bare soil surfaces with exposed plant roots or scrape scars on the surface.

E) *presence of manmade structures* - Are buildings, dams, levees, roads, or parking lots present?

2) *Determine the approximate date when the alteration occurred, if necessary.* Check aerial photographs, examine building permits, consult with local individuals, and review other possible sources of information.

3) *Describe the effects on soils.* Consider the following:

A) Has the soil been buried? If so, record the depth of fill material and determine whether the original soil was left intact or disturbed. (*Note:* The presence of a typical sequence of soil horizons or layers in the buried soil is an indication that the soil is still intact; check description in the soil survey report.)

B) Has the soil been mixed at a depth below the A-horizon or greater than 10 inches? If so, it will be necessary to examine the soil at a depth immediately below the plow layer or disturbed zone.

C) Has the soil been sufficiently altered to change the soil phase? Describe these changes. If a hydric soil has been drained to some extent, refer to Step 5 below to determine whether soil is effectively drained or is still hydric.

4) *Characterize the soils that previously existed at the disturbed site.* Obtain all possible evidence that may be used to characterize soils that previously occurred on the area. Consider the following potential sources of information:

A) *soil surveys* - In many cases, recent soil surveys are available. If so, determine the soils that were mapped for the area. If all soils are hydric soils, it is presumed that the entire area had hydric soils prior to alteration.

B) *buried soils* - When fill material has been placed over the original soil without physically disturbing the soil, examine and characterize the buried soils. Dig a hole through the fill material until the original soil is encountered. Determine the point at which the original soil material begins. Remove 18 inches of the original soil from the hole and look for indicators of hydric soils immediately

below the A-horizon and within 6-18 inches (depending on soil permeability and drainage class). Be sure to record the color of the soil matrix, presence of an organic layer, presence of mottles or gleying, and/or presence of iron and manganese concretions. (*Note:* When the fill material is a thick layer, it might be necessary to use a backhoe or posthole digger to excavate the soil pit.) If USGS topographic maps indicate distinct variation in the area's topography, this procedure must be applied in each portion of the area that originally had a different surface elevation.

C) *plowed soils* - Determine the depth to which the soil has been disturbed by plowing. Look for hydric soil characteristics immediately below this depth.

D) *removed surface layers* - Dig a hole 18 inches deep and determine whether the entire surface layer (A-horizon) has been removed. If so, examine the soil immediately below the top of the subsurface layer (B-horizon) for hydric soil characteristics. As an alternative, examine an undisturbed soil of the same soil series occurring at the same topographic position in an immediately adjacent undisturbed reference area. Look for hydric soil indicators immediately below the A-horizon and within 18 inches of the surface. Record and use these data to determine the presence of hydric soils in substep 5 below.

5) *Determine whether hydric soils were present at the project area prior to alteration.* Examine the available data and determine whether indicators of hydric soils were formerly present. If no indicators and/or evidence of hydric soils are found, the original soils are considered nonhydric soils. If indicators and/or evidence of hydric soils are found the hydric soil criterion has been met. Continue to Step 5 if hydrology also was altered. Otherwise, record decision and return to the applicable step of the onsite determination method being used.

Step 5. *Determine whether wetland hydrology existed prior to alteration or whether wetland hydrology still exists (i.e., is the area effectively drained?).* To determine whether wetland hydrology still occurs, proceed to Step 6. To determine whether wetland hydrology existed prior to the alteration:

1) *Describe the type of alteration.* Examine the area and describe the type of alteration that occurred. Look for evidence of:

A) *dams* - Has recent construction of a dam or some natural event (e.g., beaver activity or landslide) caused the area to become increasingly wetter or drier? (*Note:* This activity could have occurred at a considerable distance from the site in question, so be aware of and consider the impacts of major dams in the watershed above the project area.)

B) *levees, dikes, and similar structures* - Have levees or dikes been recently constructed that prevent the area from periodic overbank flooding?

C) *ditches* - Have ditches been recently constructed causing the area to drain more rapidly?

D) *channelization* - Have feeder streams recently been channelized sufficiently to alter the frequency and/or duration of inundation?

E) *filling of channels and/or depressions (land-leveling)* - Have natural channels or depressions been recently filled?

F) *diversion of water* - Has an upstream drainage pattern been altered that results in water being diverted from the area?

G) *groundwater withdrawal* - Has prolonged and intensive pumping of groundwater for irrigation or other purposes significantly lowered the water table and/or altered drainage patterns?

2) *Determine the approximate date when the alteration occurred, if necessary.* Check aerial photographs, consult with local individuals, and review other possible sources of information.

3) *Describe the effects of the alteration on the area's hydrology.* Consider the following and generally describe how the observed alteration affected the project area:

A) Is the area more frequently or less frequently inundated than prior to alteration? To what degree and why?

B) Is the duration of inundation and soil saturation different than prior to alteration? How much different and why?

4) *Characterize the hydrology that previously existed at the area.* Obtain and record all possible evidence that may be useful for characterizing the previous hydrology. Consider the following:

A) *stream or tidal gauge data* - If a stream or tidal gauging station is located near the area, may be possible to calculate elevations representing the upper limit of wetland hydrology based on duration of inundation. Consult SCS district offices, hydrologists from the local CE district office or other agencies for assistance. If fill material has not been placed on the area, survey this elevation from the nearest USGS benchmark. If fill material has been placed on the area, compare the calculated elevation with elevations shown on a USGS topographic map or any other survey map that predates site alteration.

B) *field hydrologic indicators onsite or a neighboring reference area* - Certain field indicators of wetland hydrology may still be present. Look for water marks on trees or other structure drift lines, and debris deposits (see pp. 17-19 for additional hydrology indicators). If adjacent undisturbed areas are in the same topographic position, have the same soils (check soil survey map), and are similarly influenced by the same sources of inundation, look for wetland hydrology indicators in these areas.

C) *aerial photographs* - Examine aerial photographs and determine whether the area has been inundated or saturated during the growing season. Consider the time of the year that the aerial photographs were taken and use only photographs taken prior to site alteration.

D) *historical records* - Examine historic records for evidence that the area has been periodically inundated. Obtain copies of any such information.

E) *National Flood Insurance Agency flood maps* - Determine the previous frequency of inundation of the area from national flood maps (if available).

F) *local government officials or other knowledgeable individuals* - Contact individuals who might have knowledge that the area was periodically inundated or saturated.

If sufficient data on hydrology that existed prior to site alteration are not available to determine whether wetland hydrology was previously present, then use the other wetland identification criteria (i.e., hydrophytic vegetation and hydric soils) to make a wetland determination.

5) *Determine whether wetland hydrology previously occurred.* Examine available data. If no indicators of wetland hydrology are found, and other evidence of wetland hydrology is lacking, the original hydrology of the area is not considered wetland hydrology. If wetland hydrology indicators and other evidence of wetland hydrology are found, the area meets the wetland hydrology criterion. Record decision and return to the applicable step of the onsite determination method being used.

Step 6. *Determine whether wetland hydrology still exists.* Many wetlands have a single ditch dissecting them, while others may have an extensive network of ditches. A single ditch through a wetland may not be sufficient to effectively drain it; in other words, the wetland hydrology criterion still may be met under these circumstances. Undoubtedly, when ditches are observed, questions as to the extent of drainage arise, especially if the ditches are part of a more elaborate stream channelization or other drainage project. In these cases and other situations where the hydrology of an area has been significantly altered (e.g., dams, levees, groundwater withdrawals, and water diversions), one must determine whether wetland hydrology still exists. If it is present, the area is not effectively drained. To determine whether wetland hydrology still exists:

1) *Describe the type or nature of the alteration.* Look for evidence of:

- A) *dams;*
- B) *levees, dikes, and similar structures;*
- C) *ditches;*
- D) *channelization;*
- E) *filling of channels and/or depressions;*
- F) *diversion of water; and*
- G) *groundwater withdrawal.*

(See Step 5 above for discussion of these factors.)

2) *Determine the approximate date when the alteration occurred, if necessary.* Check aerial photographs, consult with local officials, and review other possible sources of information.

3) *Characterize the hydrology that presently exists at the area.* The following sequence of actions is recommended:

A) *Review existing information* (e.g., stream gauge data, groundwater well data, and recent observations) to learn if data provide evidence that wetland hydrology is still present.

B) *Examine early spring or wet growing season aerial photographs for several recent years and look for signs of inundation and/or soil saturation.* (Note: Large-scale aerial photographs, 1:24,000 and larger, are preferred.) These signs of wetness indicate that the area still meets the wetland hydrology criterion. If these signs are observed, return to the applicable step of the onsite determination method being used. If such signs are not present, then one should conduct an onsite inspection as follows.

C) *Inspect the site on the ground, look for field indicators of wetland hydrology, and assess changes in the plant community, if necessary.* If field indicators of wetland hydrology (excluding hydric soil morphological characteristics) are present, then wetland hydrology exists; return to the applicable step of the onsite determination method being used. If such indicators are lacking, then examine the vegetation following an appropriate onsite determination method. If OBL and FACW plant species (especially in the herb stratum) are dominant or scattered throughout the site and UPL species are absent or not dominant, the area is considered to meet the wetland hydrology criterion and remains wetland. If UPL species predominate one or more strata (i.e., they represent more than 50 percent of the dominants in a given stratum) and no OBL species are present, then the area is considered effectively drained and no longer wetland. If the vegetation differs from the above situations, then the vegetation at this site should be compared if possible with a nearby undisturbed reference area, so proceed to substep 3D; if it is not possible to evaluate a reference site and the area is ditched, channelized or tile-drained, go to substep 3E, or else go to substep 3F.

D) *Locate a nearby undisturbed reference site with vegetation, soils, hydrology, and topography similar to the subject area prior to its alteration, examine the vegetation (following an appropriate onsite delineation method), and compare it with the vegetation at the project site.* If the vegetation is

similar, (i.e., has the same dominants or the subject area has different dominants with the same indicator status as the reference site) then the area is considered to be wetland -- the wetland hydrology criterion is presumed to be satisfied. If the vegetation has changed to where FACU and UPL species or UPL species alone predominate and OBL species are absent, then the area is considered effectively drained and is nonwetland. If the vegetation is different than indicated above, additional work is required -- go to substep 3E if the area is ditched, channelized, or tile-drained, or to substep 3F if the hydrology is modified in other ways.

E) *Determine the "zone of influence" of the ditch (or drainage structure) and the effect on the water table by using existing SCS soil drainage guides.* Obtain the appropriate guide for the project area's soil(s) and collect necessary field measurements (e.g., ditch or other drainage structure dimensions) to use the guide. The zone of influence is the area affected by the ditch. The size of this zone depends on many factors including ditch dimensions, water budget, and soil type. The guide should help identify the extent of the zone as well as the water table within the zone. If the zone of influence has a water table that fails to meet the wetland hydrology criterion, then the zone is effectively drained and is nonwetland, while hydric soil areas outside of the zone remain wetland. If the wetland hydrology criterion is met within the zone, the entire area remains wetland.

F) *Conduct detailed groundwater studies.* Make direct observations of inundation and soil saturation by establishing groundwater wells throughout the site, being sure to place them in a range of elevations so that the data obtained will be representative of the site as a whole. To maximize field effort, it may be best to collect data during the wetter part of the growing season (e.g., early spring in temperate regions). These direct observations, when made during a normal rainfall year, should show whether the wetland hydrology criterion is met. It is advisable, however, to take measurements over a multi-year period. (Note: One must be aware of regional weather patterns. For example, observations made during a number of consecutive dry years may lead to erroneous conclusions about wetland hydrology.)

If wetland hydrology still exists, return to the applicable step in the onsite determination method being used and continue delineating the wetland.

Problem Area Wetlands

4.24. There are certain types of wetlands and/or conditions that may make wetland identification difficult because field indicators of the three wetland identification criteria may be absent, at least at certain times of the year. These wetlands are considered problem area wetlands and not disturbed wetlands, because the difficulty in identification is generally due to normal environmental conditions and not the result of human activities or catastrophic natural events, with the exception of newly created wetlands. Artificial wetlands are also included in this section because their identification presents problems similar to some of the natural problem area wetlands.

4.25. Examples of these problem area wetlands are discussed below. Be sure to learn how to recognize these wetlands.

1) *Wetlands dominated by FACU plant species (or communities with a prevalence index greater than 3.5).* Since wetlands often exist along a natural wetness gradient between permanently flooded substrates and better drained soils, the wetland plant communities sometimes may be dominated by FACU species. Although FACU-dominated plant communities are usually uplands, they sometimes become established in wetlands. In order to determine whether a FACU-dominated plant community constitutes hydrophytic vegetation, the soil and hydrology must be examined. If the area meets the hydric soil and wetland hydrology criteria (see pp. 6-7), then the vegetation is hydrophytic.

In these plant communities, take the following steps to make a wetland determination:

Step 1. *Are 25 percent or more and 50 percent or less of the dominant plants in the plant community OBL, FACW, and/or FAC species, or does the community have a prevalence index greater than 3.5 and less than or equal to 4.0?* If the answer is YES, then proceed to Step 3. If NO, proceed to Step 2.

Step 2. *Is the community located: (1) in a depressional or flat area, (2) along a river, stream or drainageway, or (3) adjacent to a more typical wetland plant community (i.e., where greater than 50 percent of the dominants are OBL, FACW, and/or FAC, or where the prevalence index is less than or equal to 3.5)?* If YES, proceed to Step 3. If NO,

the plant community is usually nonwetland (proceed to Step 3 if any question). Record the data and return to the applicable step of the onsite determination method being used.

Step 3. *Are hydric soils present?* If YES, record the data and proceed to Step 4. If NO, then the area is nonwetland and the plant community is not hydrophytic. Record the data and return to the applicable step of the onsite determination method being used. (CAUTION: Become familiar with problematic hydric soils that do not possess good hydric field indicators, such as red parent material soils, some sandy soils, and some floodplain soils, so that these hydric soils are not misidentified as nonhydric soils; see pp. 58-59.)

Step 4. Answer the following questions:

1) Is there evidence of inundation or soil saturation during the growing season, as indicated by aerial photographs, recorded hydrologic data, previous site inspections, testimony of reliable persons, or direct observations?

2) Are oxidized channels (rhizospheres) present along the living roots and rhizomes of any plants growing in the area?

3) Are water-stained leaves caused by inundation present in the area?

If the answer is YES to one or more of these questions, then the area showing these signs is a wetland. Record the data and return to the applicable step of the onsite determination method being used. If the answer NO to all questions, proceed to Step 5.

Step 5. *Use one's best professional judgment in determining whether the FACU-dominated community is wetland or nonwetland. Consider the following questions in making this determination:*

1) Are other indicators of wetland hydrology present? (See pp. 17-19.)

2) Are observations being made during the dry time of the year? Would conditions be different enough during the wetter part of growing season to affect the determination?

3) Could this plant community be one of the problem area wetlands listed in the following subsection?

4) Is the dominant vegetation introduced or planted? (Note: If YES, one may choose to evaluate a nearby reference site having natural vegetation.)

5) Could the plant community reflect succession in a wetland?

6) Are OBL or UPL species present in substantial numbers?

7) If the area is forested, does a nearby reference area (where timber has not been harvested) have a plant community where more than 50 percent of the dominant species from all strata are OBL, FACW, and/or FAC species, or a plant community with a prevalence index of less than 3.0?

8) Is the region experiencing a series of dry years or long-term drought during the natural hydrologic cycle and could vegetation be reflecting this condition? If so, is hydrophytic vegetation present during the wet phase of the cycle?

9) Is the area exposed to wide annual fluctuations in vegetation, i.e., wet season vegetation is hydrophytic, while dry season vegetation is dominated by FACU and UPL species?

10) Is the area designated as wetland on National Wetlands Inventory maps, USGS topographic maps, or other maps?

In making a determination in these situations, it may be advisable to consult a wetland expert. Decide whether the area is wetland or nonwetland, record data, and return to the applicable step of the onsite determination method being used.

2) *Evergreen forested wetlands* - Wetlands dominated by evergreen trees occur in many parts of the country. In some cases, the trees are OBL, FACW, and FAC species, e.g., Atlantic white cedar (*Chamaecyparis thyoides*), black spruce (*Picea mariana*), balsam fir (*Abies balsamea*), slash pine (*Pinus elliotii*), and loblolly pine (*P. taeda*). In other cases, however, the dominant evergreen trees are FACU species, including red spruce

(*Picea rubens*), Engelmann spruce (*P. engelmannii*), white spruce (*P. glauca*), Sitka spruce (*P. sitchensis*), eastern white pine (*Pinus strobus*), pitch pine (*P. rigida*), lodgepole pine (*P. contorta*), longleaf pine (*P. palustris*), ponderosa pine (*P. ponderosa*), red pine (*P. resinosa*), jack pine (*P. banksiana*), eastern hemlock (*Tsuga canadensis*), western hemlock (*T. heterophylla*), Pacific silver fir (*Abies amabilis*), white fir (*A. concolor*), and subalpine fir (*A. lasiocarpa*). In dense stands, these evergreen trees may preclude the establishment of understory vegetation or, in some cases, understory vegetation is also FACU species. Since these plant communities are usually found on nonwetlands, the ones established in wetland areas may be difficult to recognize at first glance. The landscape position of the evergreen forested areas such as depressions, drainageways, bottomlands, flats in sloping terrain, and seepage slopes, should be considered because it often provides good clues to the likelihood of wetland. Soils also should be examined in these situations. For identification, follow procedures for FACU-dominated wetlands described above.

3) *Wetlands on glacial till* - Sloping wetlands occur in glaciated areas where thin soils cover relatively impermeable glacial till or where layers of glacial till have different hydraulic conditions that permit groundwater seepage. Such areas are seldom, if ever, flooded, but downslope groundwater movement keeps the soils saturated for a sufficient portion of the growing season to produce anaerobic and reducing soil conditions. This promotes development of hydric soils and hydrophytic vegetation. Indicators of wetland hydrology may be lacking during the drier portion of the growing season. Hydric soil indicators also may be lacking because certain areas are so rocky that it is difficult to examine soil characteristics within 18 inches.

4) *Highly variable seasonal wetlands* - In many regions (especially in arid and semiarid regions), depressional areas occur that may have indicators of all three wetland criteria during the wetter portion of the growing season, but normally lack indicators of wetland hydrology and/or hydrophytic vegetation during the drier portion of the growing season. In addition, some of these areas lack field indicators of hydric soil. OBL and FACW plant species normally are dominant during the wetter portion of the growing season, while FACU and UPL species (usually annuals) may be dominant during the drier portion of the growing season and

during and for some time after droughts. Examples of highly variable seasonal wetlands are pothole wetlands in the upper Midwest, playa wetlands in the Southwest, and vernal pools along the coast of California. Become familiar with the ecology of these and similar types of wetlands (see Appendix A for readings). Also, be particularly aware of drought conditions that permit invasion of UPL species (even perennials).

5) *Interdunal swale wetlands* - Along the U.S. coastline, seasonally wet swales supporting hydrophytic vegetation are located within sand dune complexes on barrier islands and beaches. Some of these swales are inundated or saturated to the surface for considerable periods during the growing season, while others are wet for only the early part of the season. In some cases, swales may be flooded irregularly by the tides. These wetlands have sandy soils that generally lack field indicators of hydric soil. In addition, indicators of wetland hydrology may be absent during the drier part of the growing season. Consequently, these wetlands may be difficult to identify.

6) *Vegetated river bars and adjacent flats* - Along western streams in arid and semiarid parts of the country, some river bars and flats may be vegetated by FACU species while others may be colonized by wetter species. If these areas are frequently inundated for one or more weeks during the growing season, they are wetlands. The soils often do not reflect the characteristic field indicators of hydric soils, however, and thereby pose delineation problems.

7) *Vegetated flats* - Vegetated flats are characterized by a marked seasonal periodicity in plant growth. They are dominated by annual OBL species, such as wild rice (*Zizania aquatica*), and/or perennial OBL species, such as spatterdock (*Nuphar luteum*), that have nonpersistent vegetative parts (i.e., leaves and stems breakdown rapidly during the winter, providing no evidence of the plant on the wetland surface at the beginning of the next growing season). During winter and early spring, these areas lack vegetative cover and resemble mud flats; therefore, they do not appear to qualify as wetlands. But during the growing season the vegetation becomes increasingly evident, qualifying the area as wetland. In evaluating these areas, which occur both in coastal and interior parts of the country, one must consider the time of year of the field observation and the seasonality of the

vegetation. Again, one must become familiar with the ecology of these wetland types (see Appendix A for readings).

8) *Caprock limestone wetlands* - These wetlands are found in the Everglades region of southern Florida. The substrate, commonly called "rockland," is composed mainly of Miami oolite or Tamiami limestone with a very thin covering of unconsolidated soil material in places. Plant communities are varied ranging from saw grass (*Cladium jamaicense*; OBL) marshes to slash pine (*Pinus elliotii*; FACW) forested wetlands. However, exotic species with drier indicator statuses are invading many areas and replacing native species. These exotics include Brazilian pepper (*Schinus terebinthifolius*; FAC), cajuput (*Melaleuca quinquenervis*; FAC), and Australian pines (*Casuarina* spp.; FACU). These wetlands are inundated annually and the water table is at or near the land surface for prolonged periods, as long as nine months in places. Hydric soils may not be present in many places in these wetlands, since substrate (consolidated material) predominates and little or no soil (unconsolidated material) may exist. Despite the lack of hydric soils in places, these areas are wetlands because they meet the wetland hydrology criterion.

9) *Newly created wetlands* - These wetlands include manmade (artificial) wetlands, beaver-created wetlands, and other natural wetlands. Artificial wetlands may be purposely or accidentally created (e.g., road impoundments, undersized culverts, irrigation, and seepage from earth-dammed impoundments) by human activities. Many of these areas will have indicators of wetland hydrology and hydrophytic vegetation. But the area may lack typical field characteristics of hydric soils, since the soils have just recently been inundated and/or saturated. Since all of these wetlands are newly established, field indicators of one or more of the wetland identification criteria may not be present.

10) *Entisols (floodplain and sandy soils)* - Entisols are usually young or recently formed soils that have little or no evidence of pedogenically developed horizons (U.S.D.A. Soil Survey Staff 1975). These soils are typical of floodplains throughout the U.S., but are also found in glacial outwash plains, along tidal waters, and in other areas. They include sandy soils of riverine islands, bars, and banks and finer-textured soils of floodplain terraces. Wet entisols have an aquic or peraquic moisture

regime and are considered hydric soils, unless effectively drained. Some entisols are easily recognized as hydric soils such as the sulfaquents of tidal salt marshes, whereas others pose problems because they do not possess typical hydric soil field indicators. Wet sandy entisols (with loamy fine sand and coarser textures in horizons within 20 inches of the surface) may lack sufficient organic matter and clay to develop hydric soil colors. When these soils have a hue between 10YR and 10Y and distinct or prominent mottles present, a chroma of 3 or less is permitted to identify the soil as hydric (i.e., an aquic moisture regime). Also, hydrologic data showing that NTCHS criteria #3 or #4 (p. 6) are met are sufficient to verify these soils as hydric. Become familiar with wet entisols and their diagnostic field properties (see "Soil Taxonomy", U.S.D.A. Soil Survey Staff 1975 and county soil surveys).

11) *Red parent material soils* - Hydric mineral soils derived from red parent materials (e.g., weathered clays, Triassic sandstones, and Triassic shales) may lack the low chroma colors characteristic of most hydric mineral soils. In these soils, the hue is redder than 10YR because of parent materials that remain red after citrate-dithionite extraction, so the low chroma requirement for hydric soil is waived (U.S.D.A. Soil Conservation Service 1982). Red soils are most common along the Gulf-Atlantic Coastal Plain (Ultisols), but are also found in the Midwest and parts of the Southwest and West (Alfisols), in the tropics, and in glacial areas where older landscapes of red shales and sandstones have been exposed. Become familiar with these hydric soils and learn how to recognize them in the field (see "Soil Taxonomy", U.S.D.A. Soil Survey Staff 1975 and county soil surveys).

12) *Spodosols (evergreen forest soils)* - These soils, usually associated with coniferous forests, are common in northern temperate and boreal regions of the U.S. and are also prevalent along the Gulf-Atlantic Coastal Plain. Spodosols have a gray eluvial E-horizon overlying a diagnostic spodic horizon of accumulated (sometimes weakly cemented) organic matter and aluminum (U.S.D.A. Soil Survey Staff 1975). A process called podzolization is responsible for creating these two soil layers. Organic acids from the leaf litter on the soil surface are moved downward through the soil with rainfall, cleaning the sand grains in the first horizon then coating the sand grains with organic matter and iron oxides in the second layer. Certain vegeta-

tion produce organic acids that speed podzolization including eastern hemlock (*Tsuga canadensis*), spruces (*Picea* spp.), pine (*Pinus* spp.), larches (*Larix* spp.), and oaks (*Quercus* spp.) (Buol, *et al.* 1980). To the untrained observer, the gray leached layer may be mistaken as a field indicator of hydric soil, but if one looks below the spodic horizon the brighter matrix colors often distinguish nonhydric spodosols from hydric ones. The wet spodosols (formerly called "groundwater podzolic soils") usually have thick dark surface horizons, dull gray E-horizons, and low chroma subsoils. Become familiar with these soils and their diagnostic properties (see "Soil Taxonomy", U.S.D.A. Soil Survey Staff 1975 and county soil surveys).

13) *Mollisols (prairie and steppe soils)* - Mollisols are dark colored, base-rich soils. They are common in the central part of the conterminous U.S. from eastern Illinois to Montana and south to Texas. Natural vegetation is mainly tall grass prairies and short grass steppes. These soils typically have deep, dark topsoil layers (mollic epipedons) and low chroma matrix colors to considerable depths. They are rich in organic matter due largely to the vegetation (deep roots) and reworking of the soil and organic matter by earthworms, ants, moles, and rodents. The low chroma colors of mollisols are not necessarily due to prolonged saturation, so be particularly careful in making wetland determinations in these soils. Become familiar with the characteristics of mollisols with aquatic moisture regimes, since they are usually hydric, unless effectively drained, and be able to recognize these from nonhydric mollisols (see "Soil Taxonomy", U.S.D.A. Soil Survey Staff 1975 and county soil surveys).

4.26. The steps for making wetland determinations in problem area wetlands, except FACU-dominated wetlands, are presented below. (*Note:* Procedures for FACU-dominated communities are on pp. 55-56.) Application of these steps is appro-

priate only when a decision has been made during an onsite determination that wetland indicators of one or more criteria were lacking. Specific procedures to be used will vary according to the nature of the area, site conditions, and affected criterion. A determination must be based on the best available evidence, including: (1) information obtained from such sources as aerial photos, wetland maps, soil survey maps, and hydrologic records; (2) field data collected during an onsite inspection; and (3) basic knowledge of the ecology of the particular wetland type and associated environmental conditions. (*Note:* The following procedures should only be applied to situations not adequately characterized by the onsite methods in Part IV. Be sure to record necessary information on appropriate data forms.)

Step 1. *Identify each criterion to be reconsidered and determine the reason for further consideration.* Consider how environmental conditions have affected the criterion in question (hydrophytic vegetation, hydric soil, and/or wetland hydrology). If hydrophytic vegetation is the criterion in question and the plant community is FACU-dominated, then follow special procedures presented earlier in this section (see pp. 55-56). Proceed to Step 2.

Step 2. *Document available information on each criterion in question.* Examine the available information and consider personal experience and knowledge of wetland ecology and the range of normal environmental conditions of the area. Contact local experts (e.g., government agency and university scientists) for additional information, if possible. Proceed to Step 3.

Step 3. *Determine whether each wetland criterion in question is met.* If no information can be found that demonstrates that the wetland criterion in question is satisfied, the area is nonwetland. (*EXCEPTION:* Caprock limestone wetlands do not meet the hydric soil criterion where limestone rock is the predominant substrate; this is an exception to the rule.)

APPENDIX D

Wetland Function-Value Evaluation Form

Total area of wetland _____ Human made? _____ Is wetland part of a wildlife corridor? _____ or a "habitat island"? _____

Adjacent land use _____ Distance to nearest roadway or other development _____

Dominant wetland systems present _____ Contiguous undeveloped buffer zone present _____

Is the wetland a separate hydraulic system? _____ If not, where does the wetland lie in the drainage basin? _____

How many tributaries contribute to the wetland? _____ Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. _____













Latitude _____ Longitude _____

Prepared by: _____ Date _____

Wetland Impact:
Type _____ Area _____

Evaluation based on:
Office _____ Field _____

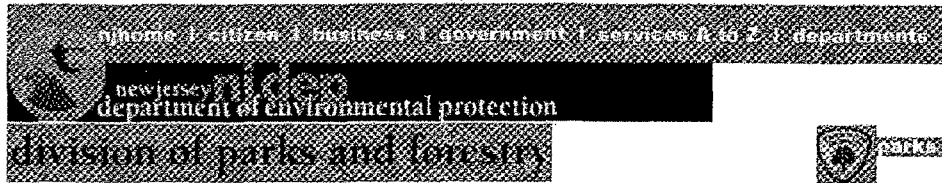
Corps manual wetland delineation
completed? Y _____ N _____

Function/Value	Suitability Y N		Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
 Groundwater Recharge/Discharge					
 Floodflow Alteration					
 Fish and Shellfish Habitat					
 Sediment/Toxicant Retention					
 Nutrient Removal					
 Production Export					
 Sediment/Shoreline Stabilization					
 Wildlife Habitat					
 Recreation					
 Educational/Scientific Value					
 Uniqueness/Heritage					
 Visual Quality/Aesthetics					
ES Endangered Species Habitat					
Other					

Notes:

* Refer to backup list of numbered considerations.

APPENDIX E



Parks and Forestry

parks and forestry links

Natural Heritage Data Request Form

This form is used to request a search of the Natural Heritage Database for records of rare or endangered species and natural communities on or near a project site. The Natural Heritage Program provides the information in order to assist the requestor in preserving habitat for rare and endangered species and natural communities.

To initiate a search, please provide:

- A) A letter explaining the project; B) A copy of a USGS quad map(s) delineating the bounds of the project site;
- C) A completed data request form.

Send completed request to:

Office of Natural Lands Management
Natural Heritage Program
PO Box 404
22 South Clinton Avenue
Trenton, NJ 08625-0404.

NAME _____

AGENCY _____

ADDRESS _____

PHONE _____

PROJECT OR SITE NAME _____

County (check those that apply):

Atlantic _____ Bergen _____ Burlington _____ Camden _____ Cape May _____ Cumberland _____

Essex _____ Gloucester _____ Hudson _____ Hunterdon _____ Mercer _____ Middlesex _____ Monmouth _____

Morris _____ Ocean _____ Passaic _____ Salem _____ Somerset _____ Sussex _____ Union _____ Warren _____

USGS QUAD(S): Any material supplied by the Office of Natural Lands Management will not be published without crediting the Natural Heritage Database as the source of the material. It is understood that there will be a charge of \$20.00 per hour for the services requested. An invoice will be sent with the request response and payment should be made by check or money order payable to "Office of Natural Lands Management."

Date Needed _____ Signature _____

FOR OFFICE USE ONLY

DATE RECEIVED _____

Item Code: REG _____ ST _____ RTC _____ NC _____

REGEO _____ STEO _____ RTCEO _____ NCEO _____

Hrs: _____

Project Code: _____ Inv. #: _____

DPF-225 9/98

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